CLAIMS

1. A chemical mechanical planarization (CMP) system, comprising:

a wafer carrier configured to support a wafer during a planarization process, the wafer carrier including a sensor configured to detect a signal indicating a stress being experienced by the wafer during planarization;

a computing device in communication with the sensor, the computing device configured to translate the signal to generate a stress map for analysis; and

a stress relief device responsive to a signal received from the computing device, the stress relief device configured to relieve the stress being experienced by the wafer.

2. The system of claim 1, includes one of a proximity sensor and a temperature sensor, the proximity sensor configured to detect a signal indicating a mechanical stress , the temperature sensor configured to detect a signal indicating a thermal stress.

3. The system of claim 2, wherein the proximity sensor is an eddy current sensor and the temperature sensor is an infrared sensor.

4. The system of claim 1, wherein the stress relief device is selected from the group consisting of a fluid supply, a platen, and a speed controller.

5. The system of claim 1, wherein the stress relief device is capable of differentially applying a corrective action to relieve the stress.

6. A chemical mechanical planarization (CMP) system capable of monitoring thermal stress associated with a substrate being processed, comprising:

a wafer carrier having a plurality of sensors, each of the plurality of sensors configured to detect a signal corresponding to a temperature of a region of the substrate;

a computing device in communication with the plurality of sensors, the computing device configured to generate a thermal map of the substrate from the signal, the computing device capable of analyzing data associated with the thermal map to identify any region of the substrate experiencing thermal stress; and

a stress relief device responsive to the computing device, wherein the stress relief device is triggered to relieve the thermal stress when the computing device identifies any region of the substrate experiencing thermal stress.

7. The system of claim 6, wherein the computing device includes a signal compensation module configured to account for a signal delay associated with the signal corresponding to the temperature.

8. The system of claim 6, wherein the wafer carrier rotatably supports the substrate over a polishing pad, the polishing pad capable of moving in a linear direction while the wafer rotates.

9. The system of claim 6, wherein the stress relief device includes a fluid supply system capable of delivering a fluid to a portion of a smoothed layer of slurry deposited over a polishing pad, the portion of the smoothed layer associated with one of the any region of the substrate experiencing thermal stress.

10. A chemical mechanical planarization (CMP) system capable of monitoring mechanical stress associated with a substrate being processed, comprising:

a wafer carrier having a sensor configured to detect a signal indicative of a mechanical load experienced by a corresponding location on the substrate during processing;

a computing device in communication with the sensor, the computing device configured to generate a mechanical stress map of the substrate from the signal, the computing device capable of analyzing data associated with the mechanical stress map to identify a region of the substrate experiencing mechanical stress; and

a stress relief device responsive to the computing device, wherein the stress relief device is triggered to relieve the mechanical stress when the computing device identifies any region of the substrate experiencing mechanical stress.

11. The system of claim 10, wherein the wafer carrier rotatably supports the substrate over a polishing pad, the polishing pad capable of moving in a linear direction while the wafer rotates.

12. The system of claim 10, wherein the stress relief device includes a drive motor, the drive motor capable of reducing one of a rotational speed of the wafer carrier and a linear velocity of a polishing pad to relieve the mechanical stress.

13. The system of claim 10, wherein the computing device is a general purpose computer and the stress relief device is one of a drive motor and a platen.

14. A process development tool configured to monitor stress conditions experienced by a substrate during semiconductor processing operations, comprising:

a sensor configured to monitor a signal indicative of a stress experienced by a substrate during processing operations within the process development tool; and

a computing device in communication with the sensor, the computing device configured to create a stress map from the signal, the computing device further configured to analyze the stress map to identify any stressed regions of the substrate so that the computing device may initiate an activity that provides relief to the stressed region.

15. The process development tool of claim 14, wherein the sensor is a proximity sensor configured to detect a distance of a location on a surface of the substrate relative to the sensor.

16. The process development tool of claim 14, wherein the sensor is an infrared sensor configured to detect a temperature associated with a location on a surface of the substrate.

17. A method for monitoring and relieving stress conditions associated with a substrate during a chemical mechanical planarization (CMP) process, comprising:

monitoring a signal corresponding to a stress condition;

generating a stress map corresponding to the substrate from the monitoring of the signal;

analyzing the stress map;

identifying a region of a surface of the substrate experiencing the stress condition; and

adjusting the CMP process to relieve the stress condition.

18. The method of claim 17, wherein the method operation of monitoring a signal corresponding to a stress condition includes,

detecting one of an infrared signal and an eddy current.

19. The method of claim 17, wherein the method operation of generating a stress map corresponding to the substrate from the monitoring of the signal includes,

analyzing an infrared signal;

developing a thermal stress map from the infrared signal; and

aligning the thermal stress map to account for a delay associated with the infrared signal.

20. The method of claim 19, wherein the method operation of aligning the thermal stress map to account for a delay associated with the infrared signal includes,

determining a rotational speed associated with the substrate during the CMP process.

21. The method of claim 17, wherein the method operation of generating a stress map corresponding to the substrate from the monitoring of the signal includes,

analyzing a signal generated from a proximity sensor; and

developing a mechanical stress map from the signal.

22. The method of claim 17, wherein the method operation of adjusting the CMP process to relieve the stress condition includes,

differentially adjusting a process condition to relieve the stress condition at the region.

23. The method of claim 17, wherein the method operation of adjusting the CMP process to relieve the stress condition includes,

disturbing a portion of a substantially uniform slurry layer corresponding to the region experiencing the stress condition.

24. The method of claim 17, wherein the method operation of generating a stress map corresponding to the substrate from the monitoring of the signal includes,

using a rotational modulation component associated with the signal for generating the stress map.